

Assessment of Students' Performance: Grading Systems

Olawale J. Omotosho*
Scholl of Computing & Engineering Sciences, Babcock University, PMB 21244, Ikeja, Lagos State, Nigeria.
*Email of corresponding author: omotoshoobabcockuni.edu.ng

Abstract

Since the advent of *course system* of education in tertiary institutions world-over, Cumulative Point Average (CGPA) has been in use as an Assessment Instrument instead of Cumulative Weighted Average Mark (CWAM). Consequently, mapping of percentage marks into an n-grade points system which is required to generate the much needed CGPA has become necessary. Countless methods of mapping have been witnessed across different tertiary institutions. In addition, the number of grade point, 'n' varies from institutions to institutions. While it is a universal fact that 'n' can take any value less than 100, it is nevertheless important to know that the value of 'n' has never been greater than 12. In Nigerian tertiary institutions, the value of 'n' varies between 4 and 7 while 5 is the most common. However, simply equating 'n' to 100 is not sufficient to convert the percentile system to an n-grade points system in order to generate the required CGPA. It is discovered that there is no sound mathematical method employed to relate the CGPA ranges normally used to classify degree to the percentage scores earned by individual students. This paper (paper 2) is primarily written to establish the required parameters and the most suitable format of an n-grade points system which is referred to as a Non-Graded Fail Grading System with a fail grade, 'F' assigned a zero value ($NGF/GS_{F=0}$) while another paper (paper 3) presents the development of the required mathematical relationship between CGPA and percentage scores ranges.

1. Introduction

There are many opinions about grading systems. As a matter of facts, there are as many as there are users of grading systems. Every training institution that is required to assess its trainees has its own format of grading system since a grading system is a platform for the application of Assessment Instruments. There are also many different Assessment Instruments that are also used by different training institutions. All these grading systems do not address the same objectives and purposes. Because of these different shades of opinions and freedom to use whichever is considered suitable for a given situation, much study has not been done on the subject. It is discovered that people copy one format or the other without knowing fully the original purpose for which what is copied is intended. This consequently leads to many assumptions, one of which is to think that there is nothing to teach anybody about grading systems. The study carried out on grading system is presented in four different papers, namely, ***Paper 1: Assessment of Student Performance: Grading Systems***, Paper 2: Parameters of Grading Systems, Paper 3: Mathematical Relationship Between Percentile & Grade Point Numbers, Paper 4: Evaluation of Grading Systems of Some Tertiary Institutions in Nigeria. The Assessment Instrument considered in this paper is the Cumulative Grade Point Average, CGPA which is the one adopted in most tertiary institutions around the world because of its unique features. Therefore, the grading system suitable for such an instrument is the subject of this paper. There are still many types of this kind depending on such factors as objectives of assessment, understanding of the CGPA and other demands for graduates being assessed. However, there are basically two types of Grading Systems being considered for CGPA. These are **Non-Graded Fail** (where only one class is allowed in a Failure Zone) and **Graded Fail** (where there are more than one class in a Fail Zone).

2. Assessment

Every form of training scheme has objective(s) and purpose(s) intended to be achieved. The performances of the trainees (students) must be measurable against these objectives in order to ensure that the training scheme is meeting its purpose(s). Three stages are required to determine the performances of the trainees as depicted in Figure 1.

2.1 ***Assessment Methods*:** These are ways of differentiating among students and giving them greater opportunities to learn from their mistakes, triumphs, practices and other provisions offered by the different methods employed. All methods must include the following components amongst others:

a) Design
b) Support
c) Marking and
d) Feedback

In addition, every method must have the following characteristics:

i) Validity
ii) Reliability & Consistence
iii) Transparency
iv) Fairness
v) Efficiency & Manageability and
vi) Effective Feedback

The examination/analysis of these different methods is not the scope of this paper.

2.2 ***Assessment Modes***: For every method of assessment, the performances of students must be expressed in one form or the other. The form in which this expression of trainees' performance takes varies from one expression to another and may be quantitative or qualitative. The diagram in Figure 2 depicts the assessment modes with different classification options.

2.3 ***Assessment Instruments or Tools***: This is very similar to Assessment Mode but defer in application. This is an expression of students' overall performance. It is the aggregate of students' performance in different activities and it is usually represented by either a number and/or a letter grade or any other symbol of expression designated to specific meaning. The diagram in Figure 7 (section 3 of this paper) depicts the classification of assessment instruments.

Assessment instruments can be quantitative or qualitative. Qualitative Assessment Instruments (QLAI) are employed for ***Instinctive Assessment Mode*** and are sufficient to fully describe the performances of the individuals being evaluated. QLAI uses such phrases and/or words as 'Very Good', 'Adequate', 'Better' and so on. Quantitative Assessment Instruments (QTAI) are predominantly applied to ***Empirical Assessment Mode*** where numbers are assigned to identify levels of evaluation.

Selective Assessment Mode is concerned with selecting the best individuals among a group of contestants. This is made possible and easy by scoring the contestants according to the objectives and purposes of the contest and by predefined, standardized and acceptable measurement variables. These measurement variables may be represented by letter grades, scores/marks, range of scores/marks or combination of them (see Table 1 through Table 4). The performances of the contestants represented by the marks scored by all contestants are arranged in ascending or descending order. The number of contestants required to be selected determines the cut-off score/mark for the group.

On the other hand, in a ***Non-Selective Assessment Mode***, individual trainees earn their scores/marks or grades which may or may not be further processed. If and when the marks/grades of individual trainees are processed, the result may be **classified** or **unclassified** as follows:

a) **Unclassified (Pass or Fail):** Non-Graded Pass and Non-Graded Fail Assessment (NGP & NGF). Number of classification here is, m = 1 (without failed zone). This is diagrammatically presented in Figure 3.

b) **1st Level Classification:** Classifying only the pass zone: Graded Pass and Non-Graded Fail Assessment (GP & NGF). Number of classification here shown in Figure 4 is, m = 4 (without failed zone). Figure 4 expresses this mode of assessment clearer.

c) **2nd Level Classification:** Classifying both the 1st Class and Failed zones: Graded-1st Class and Graded-Fail Assessment (GP, G1st & GF). Number of classification in this case, m = 11 (with failed zone). A line diagram of Figure 5 is well-suited for this type of assessment mode.

Examples of second level classification are:

i) Cambridge University, UK: Double Starred First Class, Starred First Class & Normal First Class (3 classifications within one)
ii) Oxford University, UK: Congratulatory First Class & Normal First Class (2 classifications within one).

d) **3rd Level Classification:** Classifying every grading zone: Graded-Pass and Graded-Fail Assessment (GP & GF). Number of classification in Figure 6, m = 18 (with failed zone). Similarly, Figure 6 gives a visual impression of this mode of assessment.

Assessment of students' performances has by and large been done quantitatively for the past many years. History has it that grading students' work quantitatively was developed by William Farish and it was first implemented by the University of Cambridge in 1792[i]. Since it is quantitative, it must involve numbers/numerals. These numbers/numerals may be represented by letter grades which are referred to as standardized measurements of varying levels of comprehension within a subject area. The various forms of standardized measurement variables could be as shown in Table 1 to Table 4.

The following observations concerning the contents of Table 1 through Table 4 are pertinent:

- The tables try to equate Qualitative Assessment Instrument (QLAI) which is usually a Non-Graded-Pass (NGP) and a Non-Graded-Fail (NGF) assessment with Quantitative Assessment Instrument (QTAI), a Graded-Pass (GP) and Graded-Fail (GF) assessment as much as possible.
- The levels of evaluation shown in the tables comprise of Graded-Pass (S/N 6-10) and Graded-Fail (S/N 1-5) spectra. Not all countries have their fail zone graded, instead they have only one numeral and/or expression representing 'Fail' which is designated letter grade 'F'.

- The letter grade 'F' is universally designated for 'Fail' irrespective of level/number of grading legend.
- Different expressions are employed to describe the QLAI section of the tables which are easily exhaustible and may lead to different/similar meanings causing all kinds of ambiguities.
- The first column, S/N is in a descending order. That is, S/N 10 is the highest representing the best while S/N 1 is the least signifying the worst. The order could be changed if desire without losing any significant information other than having opposite interpretation.
- The number of grades or levels of evaluation shown in the tables is ten (10). This can be more or less according to choice. Different countries have different levels of evaluation. Some choose the number of levels according to the number of classification required when Non-Selective Classified Assessment (NSCA) is desired while others choose their levels of evaluation arbitrarily. For NSCA, the number of levels of evaluation is usually equal to the number of assessment classification needed. However, if the number of levels is higher for some other reasons (see section 4, Paper4), the levels are regrouped to fix into the number of assessment classification.
- The maximum number employed, 100 is a universally accepted norm called the percentile. A multiple (150, 40, 10 or 1000, etc) of it could be used if desired.

Finally, the various variables shown in these tables are dependent upon the common practice adopted in the country of application.

3. ASSESSMENT INSTRUMENT TYPES

Individuals can be evaluated in different segments/subjects/courses that make up the complete activity required for graduation from any training centre[ii]. A single number is usually required to represent the overall performance of the individuals in the training programme. The measurement variables for different subjects/courses and the single number are both referred to as Assessment Instruments which is shown in Figure 7.

3.1 Non-Weighted Average Score/Mark (NWAM or NWAS)

NWAM is employed in situations where all activities/subjects/courses taken by the learner are rated the same in terms of contents, duration of impartation, complexity, etc. In other words, all the activities have the same weighting factor which is usually called CREDIT or UNIT in different institutions of learning.

3.1.1 Cumulative Average Score/Mark (CAM or CAS)

Cumulative Average Marks can be defined as the total average marks scored by each student in all courses or subjects taken within a given period. This is mathematically expressed as equation (1).

$$CAM = \frac{1}{N}\sum_{i=1}^{i=N} M_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

i = 1,2,3.....N.

N = total number of courses taken (passed or failed).

M_i = marks scored in all courses taken (passed & failed).

Equation (1) is an average or arithmetic mean of an ungrouped data.

Example: Table 5 shows ten students with their scores in seven courses of equal credits. The second to the last column of the table is the Cumulative Average Mark (CAM) of each student while the last column shows the relative positions of the students.

CAM is the popular assessment instrument employed in primary and secondary schools. It is also used to rank the students into their respective and relative positions as shown in the last column of Table 5. The student with the highest value of CAM is considered as the best student academically while the student with the least value of CAM take the last position in class. The least value of CAM which is considered a pass grade is determined based on pertinent factors such as:

- Overall class performance
- Established datum/standard in focus
- Quality and standard of examination
- Marking scheme adopted, etc

A Separation Property feature can be built into CAM by assigning zero value to the failed attempts (courses taken and failed). That is, scores earned less than a pass mark is assigned zero value. Thus, equation (1) becomes,

$$CAM = \frac{1}{N}\sum_{i=1}^{i=N} M_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1a)$$

Where,
i = 1,2,3.....N.
N = total number of courses taken (passed or failed).
M_i = marks scored in all courses passed only.
Equation (1a) is an average or arithmetic mean of an ungrouped data designated CAM (F = 0) while equation (1) is designated CAM (F = 1). The values of CAM (F = 1) is presented in Table 5 and of CAM (F = 0) is on Table 5a. Figure 8 shows the distinct discrimination between the two.

The features of CAM can therefore be stated as follows:

a) It does not require grouping the maximum obtainable scores/marks and assignment of grade-points. It is therefore most suitable for Non-Graded Pass and Non-Graded Fail assessment.
b) Since it does not require additional variable/parameter such as grade-points and score/mark ranges, it is not subjected to any special policy formulation to determine these variables. The only variable required is the scores earned by the learners. Hence, it is much less complicated than any other assessment instruments.
c) The scores earned in failed courses/subjects contribute positively to the value of CAM (F = 1) obtained, thereby making weak students to earn a value of CAM that are closer to that of the brighter students (see Figure 8). That is, the difference between two values of CAM (F = 1) is marginally and comparatively small, thereby producing a spectrum that is comparable with that of an analogue

signal with its error tendencies. This effect is appreciated in Table 5a and Figure 8.

3.1.2 Cumulative Average Grade Point (CAGP)

This requires that the students' scores must be represented by equivalent grade-points. This becomes obvious from the mathematical expression of CGPA given as equation (2). That is, CAGP is derivable from CGPA as here presented.

$$CGPA = \frac{\sum_{i=1}^{i=N}(GP_i * CR_i)}{\sum_{i=1}^{i-N} CR_i} \dots\dots\dots\dots\dots (2)$$

Where,

GP_i = Grade-points for all scores earned by students.

CR_i = Credit (weighting factor) for each course taken (passed or failed).

N = Total number of courses.

Hence, equation (2) is the same as CAGP by formula.

For equal credits (CR),

$$\sum_{i=1}^{i=N} CR_i = N * CR \dots\dots\dots\dots (3)$$

$$\sum_{i=1}^{i=N}(GP_i * CR_i) = CR \sum_{i=1}^{i-N} GP_i \dots\dots\dots\dots (4)$$

Therefore, equation (2) becomes,

$$\boldsymbol{CGPA = \frac{1}{N}\sum_{i=1}^{i=N} GP_i = CAGP} \dots\dots\dots\dots\dots (\mathbf{5})$$

That is, CAGP = CGPA ($CR_1 = CR_2 = \dots = CR$)

Thus, CGPA earned in courses of equal credits is the same as CAGP.

To use the same example of Table 5, it is necessary to develop a relationship between the scores/marks and the grade-points. That is, the mark range (0-100) must be grouped into the number of grade-points desired. Hence, a policy decision on the following variables is necessary:

- Number of grade-points, n. That is, n-grade-point scale.
- Grouping of score/mark ranges
- Letter Grades and assigning the grade-points either ascending or descending order.

For the purpose of this presentation, let's consider a 5-grade-point scale and the score/mark ranges as shown in Table 6.

Using the relationship in Table 6, the contents of Table 5 give rise to the contents of Table 7 and Table 8 with their calculated CAGP (a) and CAGP (b). It is pertinent to note here that this Assessment Instrument has in-built Separation Property. That is, the grade point assigned to failed courses is zero (Table 6).

Table 9 shows the comparison of CAM (Table 5), CAM (Table 5a) & CAGP (Tables 7 & 8).

The following observations about the contents of Table 9 are as follows:

- Note the changes in students' relative positions when CAGP is used as an assessment instrument. The position of the brilliant student (stud-10) remains the same in the three cases. Hence, the relative positions of students are more badly affected with academically weak students and depend also on the choice of Mark Ranges.
- For the consideration of CAM (F = 1), the weakest students are stud-4 with CAM = 49.7, & stud-5 with CAM = 49.6. These students stand failed if the values of CAM are calculated to the nearest one place of decimal. But to the nearest integer, all students would be considered passed since they all earned CAM $\geq$ 40.
- For the consideration of CAM (F = 0), the weakest students are stud-4 with CAM = 40.1, & stud-7 with CAM = 38.7 who stands failed since he earned CAM < 40. Note the level of potency of this instrument, CAM (F = 0), to discriminate and separate the academically weak from the strong students which CAM (F = 1) failed to identify.
- For the consideration of CAGP(a), the weakest students are stud-4 with CAGP = 2.14, CAM (F = 1) = 49.7 $\approx$ 50 = C or CAM (F = 0) = 40.1 $\approx$ 40 = E; stud-6 with CAGP = 2.29, CAM (F = 1) = 52.3 $\approx$ 52 = C or CAM (F = 0) = 40.6 $\approx$ 41 = E & stud-7 with CAGP = 2.29, CAM (F = 1) = 52.0 = C or CAM (F = 0) = 38.7 $\approx$ 39 = F. Note the inaccuracy introduced by score grouping which has the tendency to lump the academically weak with the strong students if the grouping is not adequately done.
- For the consideration of CAGP(b), the weakest students are stud-4 with CAGP = 1.29, CAM (F = 1) = 49.7 $\approx$ 50 = E or CAM (F = 0) = 40.1 $\approx$ 40 = F;; stud-5 with CGPA = 1.86, CAM (F = 1) = 49.6 $\approx$ 50 = E & stud-7 with CGPA = 1.86, CAM (F = 1) = 52.0 = E or CAM (F = 0) = 38.7 $\approx$ 39 = F. Note the errors here are reduced compared with CAGP(a) since the values of CAGP(b) < CAGP(a) due to smaller score intervals.
- For the consideration of CAGP, all students passed since all have CAGP $\geq$ 1 in both score/mark Ranges (a&b) but CAGP(b) is more accurate than CAGP(a) as a result of smaller and equal class intervals throughout the pass score ranges.

Apart from CAM used to assess primary and secondary school students in their respective schools, WAEC uses classified marks to obtain letter grades which are in turn assigned grade-points as follows: A (1), A (2), A (3), C (4), C (5), C (6), P (7), P (8) & F (9). These grade points for the best six subjects are added for each student to classify the students' performance into GRADE-ONE, GRADE-TWO & GRADE-THREE. There was no specific name given to this grading system but it can be seen that it is similar to the CAGP described in this paper except that the assigned grade-point is in a descending order as against the ascending order of the CAGP. For the purpose of this presentation, let this be called WAEC Assessment Instrument (WAI_1). The grades are distributed as shown in Table 11 and Figure 9.

This evaluation method, WAI_1 was modified to the present day one which does not carry any class but letter grades with their corresponding grade-points as follows: A (1), B (2), B (3), C (4), C (5), C (6), D (7), E (8) & F (9). This can be referred to as WAI_2. Because no class is involved in the new assessment grading, the grade points are not grouped. However, individual organizations may still use these grade-points to evaluate the holders of such results

in order to be able to distinguish the best among them, bearing in mind that the holder of the least aggregate is the best candidate. Table 10 is graphically represented in Figure 9.

The General Certificate of Education (GCE) of University of London uses similar evaluation method as WAI_1 with different interpretation. The letter grades are not assigned grade-points but it was established that the last pass grade of GCE was equivalent to letter grade C (credit level) of WAEC. The pass letter grades of GCE which are still valid till date are as follows: A, B, C, D & E. This grading system is not classified though the scores are grouped into A, B, C, D & E. To make it a classified grading system, definite classes will be assigned to the letter grades and/or another set of parameters, which are classified is obtained from the letter grades.

Similarly, the General Certificate of Education (GCE) Advanced Level (AL) is equally graded on a 5-grade-point scale of A, B, C, D, & E with U as Unsatisfactory (Fail). The scores/marks in each subject/course are converted to a "Unified Mark Scheme" [(UMS), similar to credit/unit earlier mentioned] according to the difficulty and weighting of the subject/course and the individual UMS for each paper is added to give an overall score. It is important to note that UMS figures for a subject/course are not the raw marks. The UMS[iii] marks for each letter grade and maximum obtainable are shown in Table 11.

The features of CAGP can therefore be stated as follows:

a) It requires grouping the maximum obtainable scores/marks and assignment of grade-points. It is therefore more suitable for Graded-Pass and/or Graded-Fail assessment. That is, it is usually employed for degree classifications.
b) Since it requires additional variable/parameter such as grade-points and score/mark ranges, it is subjected to special policy formulation to determine these variables. Because of different policies and philosophy of different institutions, this introduces different grading systems for CAGP.
c) The scores earned in failed courses/subjects do not contribute much to the value of CAGP obtained because zero value is assigned to letter grade representing failure, thereby making separation of weak students from the brighter students clearer. That is, the difference between two CAGP figures is significantly small but translates to large value of earned scores, thereby producing a spectrum that is closer to that of a digital signal. In other words, it has what is known as a **separation property** in lossless network driving impedances.
d) In order to take full advantage of the Separation Property of CAGP, it is required to group the pass score/mark ranges bearing in mind the following necessities:
    - The score/mark ranges must have equal intervals throughout the pass zone
    - These intervals must be as small as practically possible.

3.2 Weighted Average Score/Mark (WAS or WAM)

In tertiary institutions, courses are designed to have different weighting factors (credits) according to their importance, contents, complexity and so on. WAM is widely used in this type of situation.

3.2.1 Cumulative Weighted Average Score/Mark (CWAM or CWAS)

This is similar to Cumulative Average Score/Marks discussed earlier and it is defined as the total average marks scored by each student in all courses or subjects taken within a given period. This is mathematically expressed as in equation (6).

$$CWAM = \frac{1}{\sum_{i=1}^{i=N} CR_i} \sum_{i=1}^{i=N} (M_i * CR_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where,
i = 1,2,3.....N.
N = total number of courses taken (passed or failed).
M_i = marks scored in all courses taken (passed & failed).
Equation (6) is an average or arithmetic mean of an ungrouped data and has same form with the equation for Cumulative Grade Point Average (CGPA) having GP being replaced with M_i.

NOTE: Separation Property can also be built into equation (6) as it is done for equation (1). That is, M_i < pass score/mark is assigned zero value.

Example: Table 12 shows ten students with their scores in seven courses of varying credits. The second to the last column of the table is the Cumulative Weighted Average Mark (CWAM) of each student while the last column shows the relative positions of the students.

CWAM is not a popular assessment instrument because courses/subjects taken at lower levels of educational enterprises are not of varying weighting factor. On the other hand at higher level such as tertiary level of education where the courses are designed to have varying credit values, CWAM like CAM does not distinguish clearly the difference between the bright and the weak students. Hence, it features limit its application to lower levels of educational enterprises.

CWAM has the same features as CAM because the mathematical expressions for both are logically the same and can be proved to be the same. Hence, wherever CAM can be used for its advantages, CWAM can equally be adopted.

3.2.2 Cumulative Grade Point Average for Graded-Pass & Non-Graded-Fail Assessments

This is the most popular assessment instrument that is being adopted in major tertiary institutions around the world in different shades and forms and it is the major concern of this paper. From equations (1), (2) & (6), it is obvious that this is not different mathematically from CAM, CWAM and CAGP earlier discussed. For clarity equation (2) is here repeated as

$$CGPA = \frac{\sum_{i=1}^{i=N} (GP_i * CR_i)}{\sum_{i=1}^{i-N} CR_i} \ldots\ldots\ldots\ldots\ldots (2)$$

This equation has the same form as equation (6) except that M_i is replaced by GPi = grade-point allocated to scores/marks earned in each course taken (passed & failed). The allocation of GPs to scores/marks earned involves grouping the allowable scores

(usually 0-100) into numbers of classes/divisions required for assessment in a similar manner as WAI.

This means that ONLY the academic assessments that require to be classified into categories need to use CGPA instrument. Another important feature of CGPA is that failure grades/marks is assigned a zero value since it does not make sense to classify failure. In some institutions however, the failure region is graded with multiple failed letter grades thereby allocating more than one non-zero value to failed letter grades. This is examined in papers 2 & 3 .

There are two independent variables (CR & GP) in equation (2) and only one (CR) of them can be obtained from the courses taken by the learners. The other (GP) has to be developed as per policy and philosophy of assessing institutions. This is what leads to the development of a Grading System peculiar to an Institution, a subject matter of paper 3.

4. RATIONALE FOR GRADING SYSTEM DEVELOPMENT

Students' evaluation is sacrosanct to the quality of award of degrees in any university. If the quality of training is high but the assessment method/tool is faulty, the student will end up being incorrectly and inadequately classified. Correct and/or accurate assessment of students' performance is as equally important (if not more) as the quality of training (teaching, modelling, mentoring & moulding) especially in a wholistic training scheme.

Most universities (if not all) world over have adopted an assessment tool known as Cumulative Grade Point Average (CGPA) to evaluate students' performance. A very in-depth study of CGPA has shown that it is the best tool to describe students' performance in a single numeral but unfortunately, many universities have not been applying it correctly resulting in wrong classification of students' performance (see Paper 4).

CGPA calculation requires a particular Grading System (GS) to be developed because the students' scores/marks are required to be converted into its corresponding CGPAs. This is diagrammatically represented in Figure 10.

A **grading system** is like a **generator**. When the inputs into it are scores/marks, it generates corresponding CGPAs and this is referred to as Forward Integration, Figure 10(a). In this case, the grading system can be called **CGPA Generator**. On the other hand, when the inputs into it are CGPAs/grade points (GPs), it generates corresponding scores/marks and this is referred to as Backward Integration, Figure 10(b). Hence, the grading system can be called **Score Generator**. This concept is similar to what is devised in digital electronics as Analogue-to-Digital Converter (ADC) and Digital-to-Analogue Converter (DAC).

In Figure 10(a), if the fundamental SCORES are changed, it is expected that a new set of CGPAs will emerge. Similarly, in Figure 10(b), if the fundamental CGPAs are changed, it is expected that a new set of SCORES will emerge. The value of 'n' varies from universities to universities usually from 4 to 12 is common and it is this value that determines a particular

grading system. Hence, there are numerous grading systems to choose from but the most popular ones are the 4-point (n = 4) and the 5-point (n = 5) grading systems.

Once a suitable grading system is established by a university, there is no reason for the fundamental SCORES/CGPAs to be changed. Hence, the grading system becomes the blue-print or standard throughout the life of that university. However, if a new policy requires that the fundamental SCORES/CGPAs are to be changed, the corresponding CGPAs/SCORES will have to be found and established as the new blue-print. This scenario has not been experienced for many years. Hence, the original grading system developed by the first set of universities has moved from one university to another till this day without changing any of the fundamental variables/parameters and consequently the fundamental principles of arriving at the grading system has not been revisited and it has been assumed to remain constant or automatic.

The advent of private universities in Nigeria, some of which have decided to change the fundamental variables in order to exhibit superior academic excellence over their public counterparts, has made it necessary to develop new CGPAs/SCORES for the same or new grading system. This practice has introduced errors into the classification of degrees as the fundamental SCORES are changed and the same old CGPAs are retained. Consequently, the following areas of error are identified:

a) ***A university that claims to be using a 4-point grading system, groups attainable scores/marks into classes greater than 4. An example of such is presented in Tables 13 & 14.***

b) ***A university that claims to be using a 4-point grading system, groups attainable scores/marks into classes greater than 4 as presented in Tables 13 & 14 and fails to graduate students with CGPA less than a defined value other than the grade point assigned to letter grade F. For an example from Tables 13 & 14, students with CGPA < 2.00 (that is, letter grade less than 'C') cannot graduate.***
This requirement for graduation contradicts the fundamental principles of the assessment tool (CGPA) because it does not agree with the independent variables, the fundamental SCORES as grouped, that generate the corresponding CGPAs. This shows the arbitrariness in the application of the assessment tool. However, for universities that have their failure range graded, this requirement may make sense provided letter grades 'C-' and 'D' are recognized and labelled as failure grades in addition to letter grade 'F'.

c) ***A university that claims to be using a 5-point grading system, but ends up classifying its students' performance into four divisions or less.***
This violates the fundamental principles of grading systems. It is a sign of complete ignorance of the theories, assumptions, postulations and axioms of grading systems (see papers 2 & 3).

NOTE: Universities that use the grade-point system to evaluate their students' performance from the start to the end of assessment processes do not need any conversion process. Hence, a special grading system or converter is not required, even though the grade-point system being used is normally called a grading system as well.

4.1 Types of Grading System (CGPA Processor)

Arithmetic Progression is employed to distribute the grade-point among the identified score/mark ranges. The ways the grade-point is assigned/distributed among the score/mark ranges constitute different grading systems or CGPA Processors. This is diagrammatically represented in Figure 11 and the details are presented in Paper 2.

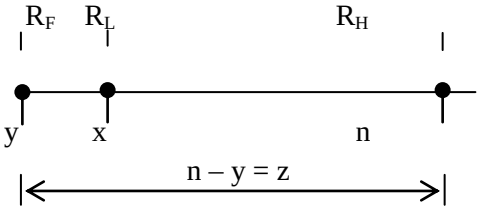
The most popular type is the Non-Graded-Fail Grading System (NGF/GS) from which the other two are derived. Hence, this paper deals more on this type of grading system than the others.

4.1.1 Non-Graded-Fail Grading System (NGF/GS)

This is the fundamental or the root of all types of Grading System. It is non-extended and non elongated system. In general, a z-point CGPA processor is mathematically expressed by an empirical/symbolical formula as

$(NGF/GS)_{F=Y}$ = (z-point)y,x ..... (7) and

z = n-y ..... (8)



where, z = the number associated with the Grading System.

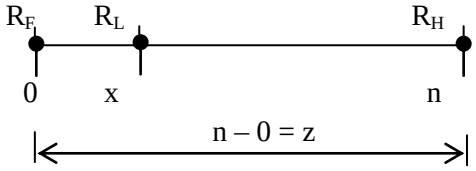
x = the value of grade-point assigned to the least pass mark range.

y = the value of grade-point assigned to the fail score/mark range or letter grade, F.

n = maximum grade-point assigned to the highest pass score/mark range.

Therefore,

$(NGF/GS)_{F=0}$ = (n-point)x ..... (9)



4.1.2 Extended Grading System (ExGS)

An Extended Grading System is one that exhibits the mathematical feature of factorization. When a multiplying factor (f) is applied to equation (9), an Extended Grading System is obtained. Thus, the mathematical expression for ExGS is given as

$(ExGS)_{F=0}$ = f[$(NGS)_{F=0}$] = f[(n-point)x] = (fn-point)fx

$(ExGS)_{F=0}$ = (fn-point)fx ..... (10)

$(ExGS)_{F=y}$ = f[$(NGS)_{F=y}$] = f[(z-point)x] = (fz-point)fy,fx

$(ExGS)_{F=y}$ = (fz-point)fy,fx ..... (11)

The common difference is a multiple of the multiplying factor, f. That is, if for $(NGF/GS)_{F=0}$ the common difference is an integer and it is one (1), for $(ExGS)_{F=0}$, the common difference will be f = 1.f.

4.1.3 Elongated Grading System (ElGS)

On the other hand, when the grade-point (GP = n) is divided into integer/non-integer values (integers & fractions as against integers only) and they are assigned to different score/mark ranges, an Elongated Grading System emerges. This process elongates the score/mark ranges beyond that of NGF/GS but still maintains the maximum GP as 'n'. Note the difference between ExGS which has its final GP = fn, increased by a factor, f & ElGS that maintains the same GP = n. Hence, the mathematical expression for ElGS is similar to that of NGF/GS given as

$(ElGS)_{F=0}$ = (n-point)x ..... (12)

$(ElGS)_{F=y}$ = (z-point)y,x ..... (13)

The common difference is usually a fraction. Tables 13 & 14 are a typical examples except that the distribution fails to follow any known progression.

ElGS has the following characteristics:

- It has the tendency of creating or causing a situation that leads to having a Graded-Fail system from a Non-Graded-Fail situation.
- If the Graded-Fail system is to be reduced to Non-Graded-Fail, it will cause a non-zero value to be assigned to a non-graded fail range, creating a situation where equation (10) is applicable.
- If the resulting CGPAs are to be used to classify students' performance into fewer divisions than what ElGS produce, a recombination of the CGPAs is required.
- It also exhibits factorization principles like the NGF/GS.

(Details of this are presented in paper 2).

5. NATIONAL DEGREE CLASSIFICATION

For uniformity and ease of comparing quality of one degree to another, the assessment instruments must be the same. CGPA is the most popular instrument of evaluation among most universities in the world today. Despite this fact, different grading scales and free choices of ranges of marks and CGPA remain the factors causing the differences found in degree classification from one university to another and/or from one country to another.

Therefore, in order to have a national uniform degree classification, a uniform grading system or assessment scale must be adopted with its parameters centrally controlled. The empirical formula developed in paper 2 is recommended because its parameters or variables are easy to monitor, control and maintain since they are well defined.

It is also important that the same scoring pattern is adopted as it is presently in all levels of Nigerian educational system where the percentile system (0 to 100) is employed. In this percentile system, once M_L and M_H are nationally determined as grading system variables, the maximum pass mark range [R_H = (0 to M_H)] and the fail range [R_F = (0 to M_H)] are automatically specified. The remaining interval which is [(M_H+1) to (M_L – 1)] is required to be divided into (m – 1) ranges in any particular fashion (though, equal division is recommended) as may be determined at the central supervisory level as a matter of national policy.

It is equally important that the components of the marks earned by all students must be the same. It is a common practice these days to make the scores/marks earned to comprise of two major components which are popularly tagged as Final Examinations (FE) and Continuous Assessment (CA). That is, for an example, M_L is made of FE% + CA%. The percentage of FE and CA must also be centrally controlled to maintain compatibility of degree classification. The subcomponents of CA are equally important and will certainly influence the integrity of classification. The two popular variations in Nigerian universities are shown in Table 14.

In addition, the following modalities must be enforced:

- The pass mark ranges, R_{MR} must be the same in all Nigerian universities (adopt equal class intervals).
- The grade point ranges, R_{GP} must be the same in all Nigerian universities (adopt Arithmetic Progression of a common difference of 1).
- The CGPA ranges, R_{CG} must be the same in all Nigerian universities (adopt equal class interval ratios & allow the class intervals of R_{MR} to dictate these ranges).

Whenever the grading system and/or assessment instrument changes, new parameters that need to be uniformized would also emerge. This is what WAEC has done to secondary school leaving certificates across West Africa Region.

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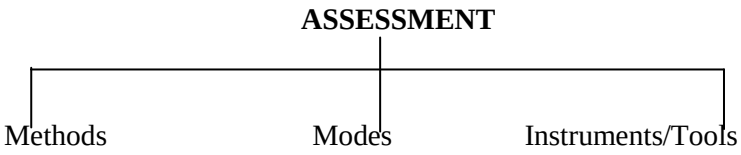


Figure 1: Stages of Assessment

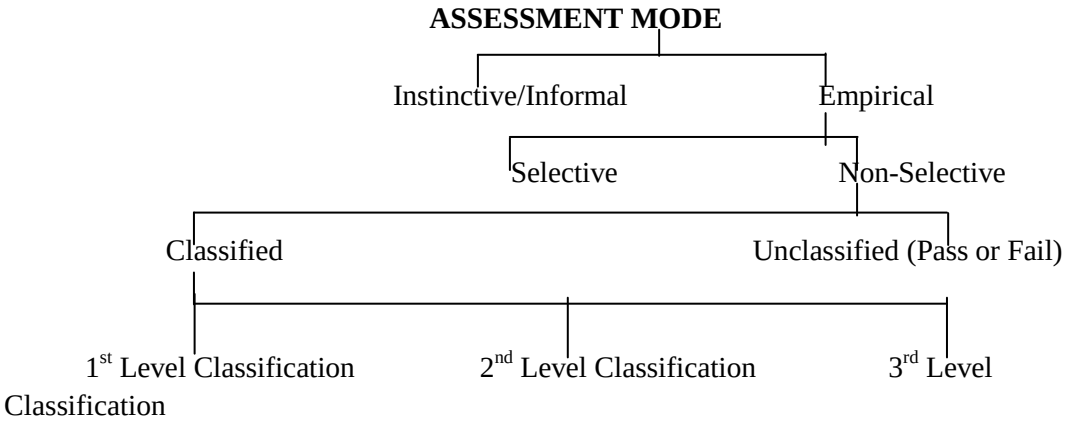


Figure 2: Assessment Modes With Classification Options

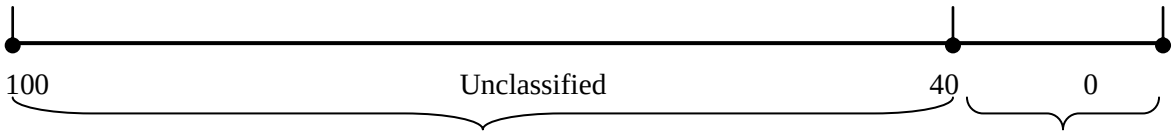


Figure 3: Unclassified (Pass or Fail) Assessment: Non-Graded-Pass & Non-Graded-Fail

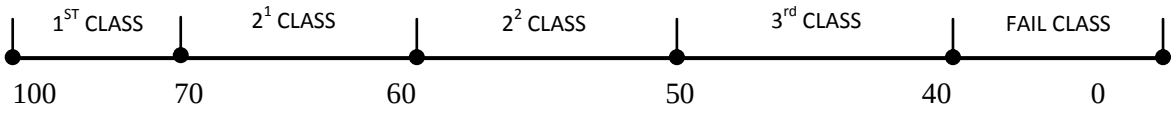


Figure 4: First Level Classification Assessment: Graded-Pass & Non-Graded-Fail

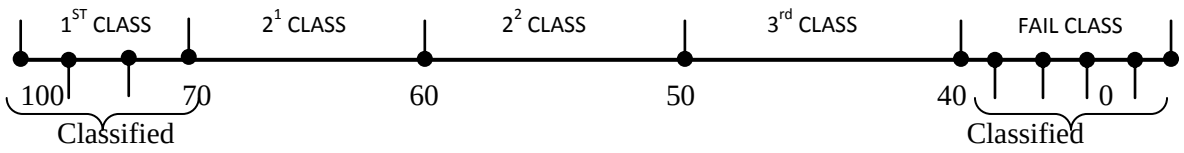


Figure 5: Second Level Classification Assessment: Graded-Pass, Graded-1st Class & Graded-Fail

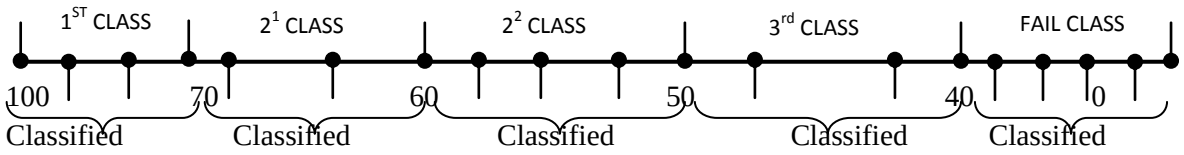


Figure 6: Third Level Classification Assessment: Graded-Pass & Graded-Fail

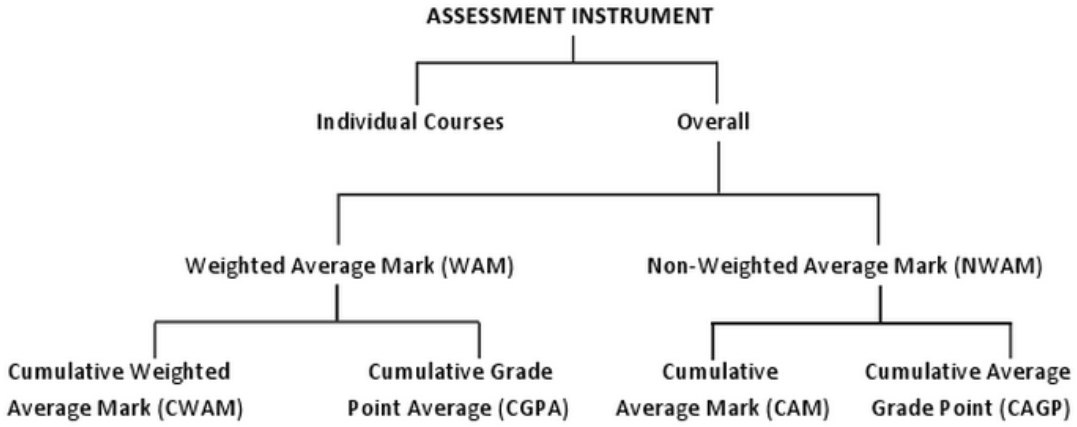


Figure 7: Classification of Assessment Instruments

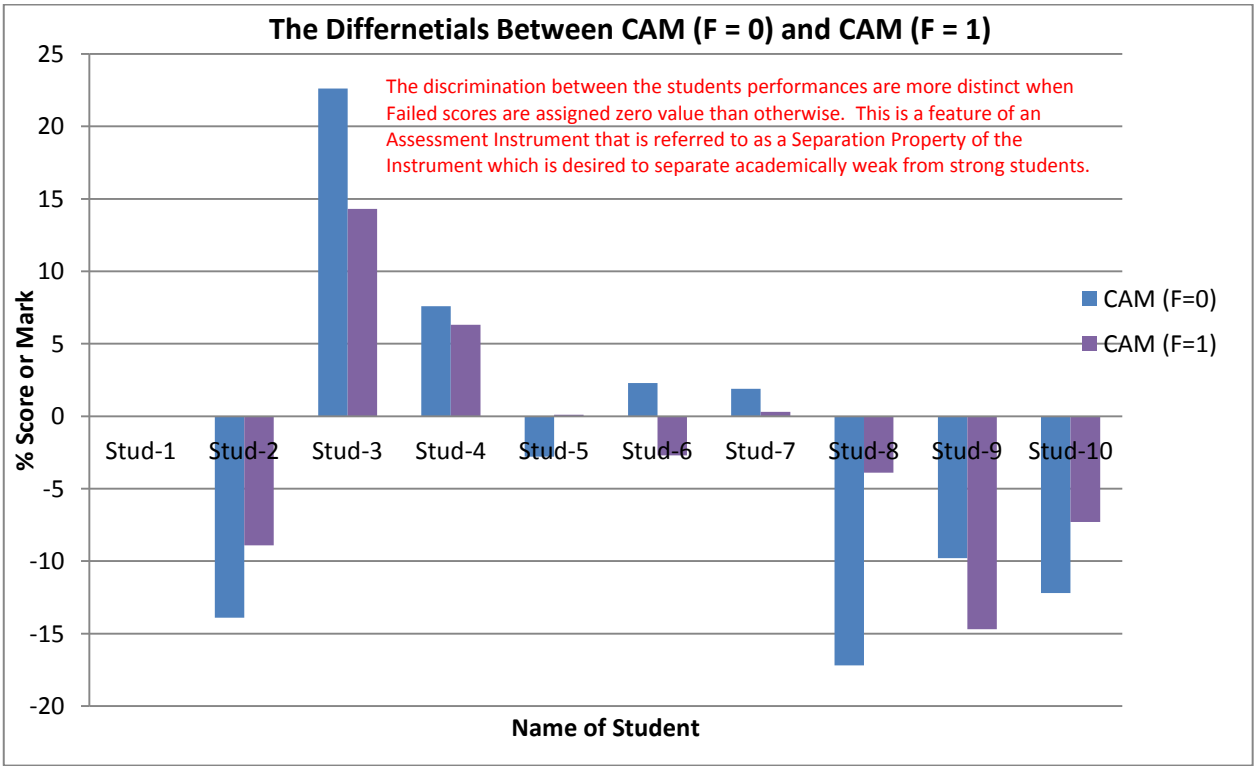
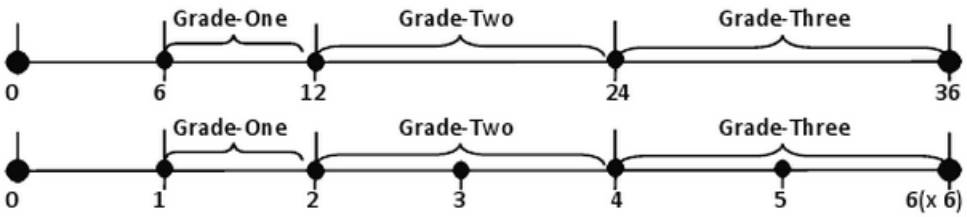


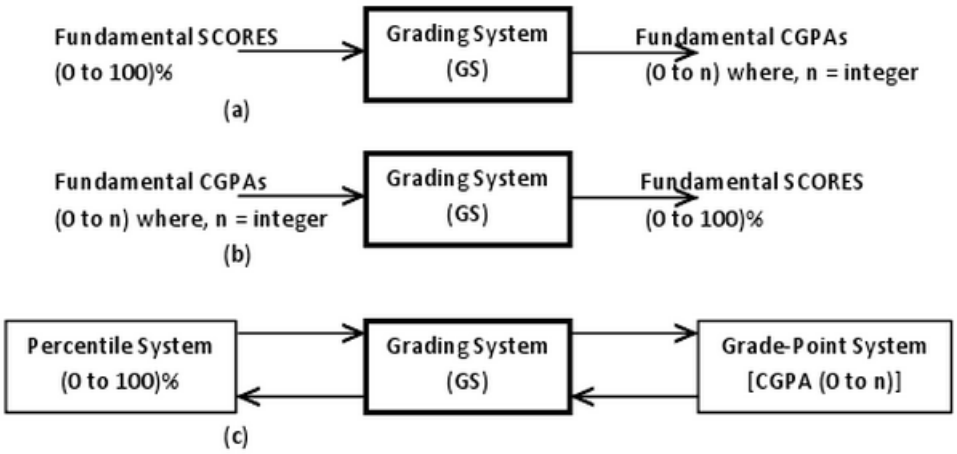
Figure 8: Graph of CAM Showing Effect of Assigning Finite Numeral to Fail Grade

Figure 8: Graph of CAM Showing Effect of Assigning Finite Numeral to Fail Grade



Note: This is like a 6-grade-point scale multiply by a common factor of 6

Figure 9: Classification of WAEC Results



(a) Forward Integration, (b) Backward Integration & (c) Combined Operation of (a) & (b)

Figure.10: Grading System (Score/CGPA Converter)

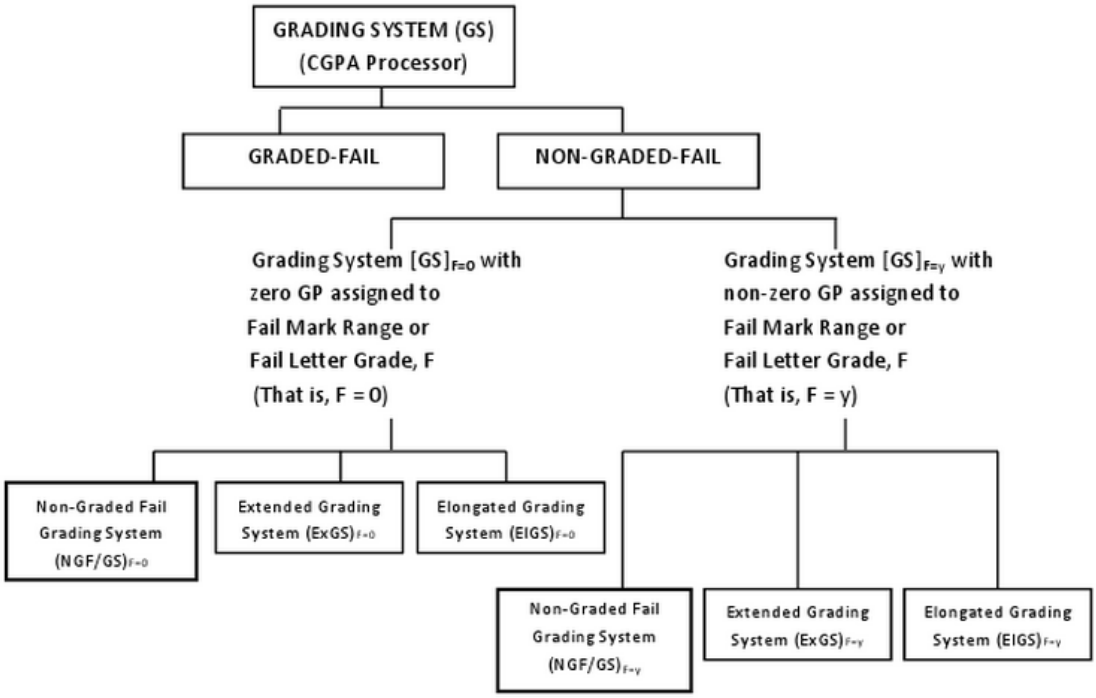


Figure 11: Types of Grading System/CGPA Processor

Table 1: Grades by Letters, A, B, ...

QUANTITATIVE			QUALITATIVE
S/N	**LETTER GRADE**	**PASS/FAIL ZONES**	**DESCRIPTION**
10	A	**PASS ZONE**	Excellent, Outstanding, Superior, Impeccable
9	B		Very Good,
8	C		Good
7	D		More than sufficient, More Adequate
6	E		Sufficient, Adequate
5	G	**FAIL ZONE**	Nearly Sufficient, Not Adequate but Acceptable
4	H		Insufficient, Fairly Acceptable
3	I		Strongly Insufficient, May be Acceptable
2	J		Totally Insufficient, May be Acceptable, Poor
1	F		Weak, Fail, Insufficient, Certainly not Acceptable, Very Poor

Table 2: Grades by Numbers, 100, 95, ...

QUANTITATIVE (QTAI)			QUALITATIVE (QLAI)
S/N	**SCORE GRADE**	**PASS/FAIL ZONES**	**DESCRIPTION**
10	100	**PASS ZONE**	Excellent, Outstanding, Superior, Impeccable
9	95		Very Good,
8	90		Good
7	85		More than sufficient, More Adequate
6	80		Sufficient, Adequate
5	75	**FAIL ZONE**	Nearly Sufficient, Not Adequate but Acceptable
4	70		Insufficient, Fairly Acceptable
3	65		Strongly Insufficient, May be Acceptable
2	60		Totally Insufficient, May be Acceptable, Poor
1	50		Weak, Fail, Insufficient, Certainly not Acceptable, Very Poor

Table 3: Grades By Ranges of Numbers, (95-100), (80-94), ...

QUANTITATIVE (QTAI)			QUALITATIVE (QLAI)
S/N	**SCORE GRADE**	**PASS/FAIL ZONES**	**DESCRIPTION**
10	95-100	**PASS ZONE**	Excellent, Outstanding, Superior, Impeccable
9	80-94		Very Good,
8	75-79		Good
7	70-74		More than sufficient, More Adequate
6	65-69		Sufficient, Adequate
5	60-64	**FAIL ZONE**	Nearly Sufficient, Not Adequate but Acceptable
4	55-59		Insufficient, Fairly Acceptable
3	50-54		Strongly Insufficient, May be Acceptable
2	45-49		Totally Insufficient, May be Acceptable, Poor
1	40-44		Weak, Fail, Insufficient, Certainly not Acceptable, Very Poor

Table 4: Grades by Both Letters & Numbers, A, B, .. & (95-100), (80-94), ...

QUANTITATIVE (QTAI)			QUALITATIVE (QLAI)	
S/N	**LETTER GRADE**	**PASS/FAIL ZONES**	**SCORE GRADE**	**DESCRIPTION**
10	A	**PASS ZONE**	95-100	Excellent, Outstanding, Superior, Impeccable
9	B		80-94	Very Good,
8	C		75-79	Good
7	D		70-74	More than sufficient, More Adequate
6	E		65-69	Sufficient, Adequate
5	G	**FAIL ZONE**	60-64	Nearly Sufficient, Not Adequate but Acceptable
4	H		55-59	Insufficient, Fairly Acceptable
3	I		50-54	Strongly Insufficient, May be Acceptable
2	J		45-49	Totally Insufficient, May be Acceptable, Poor
1	F		40-44	Weak, Fail, Insufficient, Certainly not Acceptable, Very Poor

Table 5: Calculation of CAM

Name of Student	**Cos-1**	**Cos-2**	**Cos-3**	**Cos-4**	**Cos-5**	**Cos-6**	**Cos-7**	**CAM**	**POS**
	3	3	3	3	3	3	3		
Stud-1	60	70	49	87	53	76	35	**61.4**	**4th**
Stud-2	56	67	93	44	68	77	87	**70.3**	**3rd**
Stud-3	25	93	46	72	55	68	33	**56.0**	**5th**
Stud-4	28	67	54	45	68	39	47	**49.7**	**9th**
Stud-5	42	63	50	35	65	80	12	**49.6**	**10th**
Stud-6	90	35	56	29	18	80	58	**52.3**	**7th**
Stud-7	31	80	79	58	27	35	54	**52.0**	**8th**
Stud-8	80	67	72	34	56	42	40	**55.9**	**6th**
Stud-9	87	34	54	85	82	63	89	**70.6**	**2nd**
Stud-10	65	80	75	79	78	85	83	**77.9**	**1st**
N = 7, For Stud-1, M_1 = 60, M_2 = 70, ...M_7 = 35									

Table 5a: Calculation of CAM with score < 40 assigned zero value

Name of Student	**Cos-1**	**Cos-2**	**Cos-3**	**Cos-4**	**Cos-5**	**Cos-6**	**Cos-7**	**CAM**	**POS**
	3	3	3	3	3	3	3		
Stud-1	60	70	49	87	53	76	0	**56.4**	**4th**
Stud-2	56	67	93	44	68	77	87	**70.3**	**2nd**
Stud-3	0	93	46	72	55	68	0	**47.7**	**6th**
Stud-4	0	67	54	45	68	0	47	**40.1**	**9th**
Stud-5	42	63	50	0	65	80	0	**42.9**	**7th**
Stud-6	90	0	56	0	0	80	58	**40.6**	**8th**
Stud-7	0	80	79	58	0	0	54	**38.7**	**10th**
Stud-8	80	67	72	0	56	42	40	**55.9**	**5th**
Stud-9	87	0	54	85	82	63	89	**65.7**	**3rd**
Stud-10	65	80	75	79	78	85	83	**77.9**	**1st**
N = 7, For Stud-1, M_1 = 60, M_2 = 70, ...M_7 = 35									

Table 6: Grade-Point/Mark Range/Letter Grade Relationship

GRADE-POINT	MARK RANGE (a)	MARK RANGE (b)	LETTER GRADE
5	70-100	70-100	A
4	60-69	65-69	B
3	50-59	60-64	C
2	45-49	55-59	D
1	40-44	50-54	E
0	0-39	0-49	F

Table 7: Calculation of CAGP Using Mark Range (a)

Name of Student	Cos-1	Cos-2	Cos-3	Cos-4	Cos-5	Cos-6	Cos-7	CAGP (a)	POS
	3	3	3	3	3	3	3		
Stud-1	B,4	A,5	D,2	A,5	C,3	A,5	F,0	**3.43**	**3rd**
Stud-2	C,3	B,4	A,5	E,1	B,4	A,5	A,5	**3.86**	**2nd**
Stud-3	F,0	A,5	D,2	A,5	C,3	B,4	F,0	**2.71**	**4th**
Stud-4	F,0	B,4	C,3	D,2	B,4	F,0	D,2	**2.14**	**7th**
Stud-5	E,1	B,4	C,3	F,0	B,4	A,5	F,0	**2.43**	**5th**
Stud-6	A,5	F,0	C,3	F,0	F,0	A,5	C,3	**2.29**	**6th**
Stud-7	F,0	A,5	A,5	C,3	F,0	F,0	C,3	**2.29**	**6th**
Stud-8	A,5	B,4	A,5	F,0	C,3	E,1	E,1	**2.71**	**4th**
Stud-9	A,5	F,0	C,3	A,5	A,5	B,4	A,5	**3.86**	**2nd**
Stud-10	B,4	A,5	A,5	A,5	A,5	A,5	A,5	**4.86**	**1st**
N = 7, For Stud-1, $GP_1 = 4$, $GP_2 = 5$, ...$GP_7 = 0$									

Table 8: Calculation of CAGP Using Mark Range (b)

Name of Student	Cos-1	Cos-2	Cos-3	Cos-4	Cos-5	Cos-6	Cos-7	CAGP (b)	POS
	3	3	3	3	3	3	3		
Stud-1	C,3	A,5	F,0	A,5	E,1	A,5	F,0	**2.71**	**4th**
Stud-2	D,2	B,4	A,5	F,0	B,4	A,5	A,5	**3.57**	**2nd**
Stud-3	F,0	A,5	F,0	A,5	D,2	B,4	F,0	**2.29**	**5th**
Stud-4	F,0	B,4	E,1	F,0	B,4	F,0	F,0	**1.29**	**8th**
Stud-5	F,0	C,3	E,1	F,0	B,4	A,5	F,0	**1.86**	**7th**
Stud-6	A,5	F,0	D,2	F,0	F,0	A,5	D,2	**2.00**	**6th**
Stud-7	F,0	A,5	A,5	D,2	F,0	F,0	E,1	**1.86**	**7th**
Stud-8	A,5	B,4	A,5	F,0	D,2	F,0	F,0	**2.29**	**5th**
Stud-9	A,5	F,0	E,1	A,5	A,5	C,3	A,5	**3.43**	**3rd**
Stud-10	B,4	A,5	A,5	A,5	A,5	A,5	A,5	**4.86**	**1st**
N = 7, For Stud-1, $GP_1 = 3$, $GP_2 = 5$, ...$GP_7 = 0$									

Table 9: Comparison of CAM & CAGP

Name of Student	CAM (F=1)	POS	CAGP (a)	POS	CAGP (b)	POS	CAM (F=0)	POS
Stud-1	**61.4**	**4th**	**3.43**	**3rd**	**2.71**	**4th**	**56.4**	**4th**
Stud-2	**70.3**	**3rd**	**3.86**	**2nd**	**3.57**	**2nd**	**70.3**	**2nd**
Stud-3	**56.0**	**5th**	**2.71**	**4th**	**2.29**	**5th**	**47.7**	**6th**
Stud-4	**49.7**	**9th**	**2.14**	**7th**	**1.29**	**8th**	**40.1**	**9th**
Stud-5	**49.6**	**10th**	**2.43**	**5th**	**1.86**	**7th**	**42.9**	**7th**
Stud-6	**52.3**	**7th**	**2.29**	**6th**	**2.00**	**6th**	**40.6**	**8th**
Stud-7	**52.0**	**8th**	**2.29**	**6th**	**1.86**	**7th**	**38.7**	**10th**
Stud-8	**55.9**	**6th**	**2.71**	**4th**	**2.29**	**5th**	**55.9**	**5th**
Stud-9	**70.6**	**2nd**	**3.86**	**2nd**	**3.43**	**3rd**	**65.7**	**3rd**
Stud-10	**77.9**	**1st**	**4.86**	**1st**	**4.86**	**1st**	**77.9**	**1st**

Table 10: Classification of WAEC Results – WAEC Assessment Instrument (WAI_1)

GRADE-ONE	GRADE-TWO	GRADE-THREE
$6A_1 = 6$	$6A_2 = 12$	$6C_4 = 24$
$5A_1 + A_2 = 7$	$5A_2 + A_3 = 13$	$5C_4 + C_5 = 25$
$4A_1 + 2A_2 = 8$	$4A_2 + 2A_3 = 14$	$4C_4 + 2C_5 = 26$
$3A_1 + 3A_2 = 9$	$3A_2 + 3A_3 = 15$	$3C_4 + 3C_5 = 27$
$2A_1 + 4A_2 = 10$	$2A_2 + 4A_3 = 16$	$2C_4 + 4C_5 = 28$
$A_1 + 5A_2 = 11$	$A_2 + 5A_3 = 17$	$C_4 + 5C_5 = 29$
	$6A_3 = 18$	$6C_6 = 30$
	$5A_3 + C_4 = 19$	$5C_5 + C_6 = 31$
	$4A_3 + 2C_4 = 20$	$4C_5 + 2C_6 = 32$
	$3A_3 + 3C_4 = 21$	$3C_6 + 3C_6 = 33$
	$2A_3 + 4C_4 = 22$	$2C_5 + 4C_6 = 34$
	$A_3 + 5C_4 = 23$	$C_5 + 5C_6 = 35$
		$6C_6 = 36$

[iv]**Table 11: Unified Mark Scheme Points/Letter Grade Relationship**

LETTER GRADE	UMS for system-1	UMS for system-2	UMS for system-3
	UMS (max) = 600	**UMS (max) = 300**	**UMS (max) = 100**
A	480	240	80
B	420	210	70
C	360	180	60
D	300	150	50
E	240	120	40

Table 12: Calculation of CWAM

Name of Student	Cos-1	Cos-2	Cos-3	Cos-4	Cos-5	Cos-6	Cos-7	CWAM	POS
	1	3	2	2	3	1	3		
Stud-1	60	70	49	87	53	76	35	**59**	**4**
Stud-2	56	67	93	44	68	77	87	**72**	**2**
Stud-3	25	93	46	72	55	68	33	**58**	**5**
Stud-4	28	67	54	45	68	39	47	**54**	**7**
Stud-5	42	63	50	35	65	80	12	**45**	**8**
Stud-6	90	35	56	29	18	80	58	**45**	**8**
Stud-7	31	80	79	58	27	35	54	**55**	**6**
Stud-8	80	67	72	34	56	42	40	**55**	**6**
Stud-9	87	34	54	85	82	63	89	**70**	**3**
Stud-10	65	80	75	79	78	85	83	**79**	**1**
For Stud-1, M_1 = 60, M_2 = 70, ...M_7 = 35, $\sum CR_i = 1+3+2+2+3+1+3 = 15$									

Table 12: Attainable Score/Mark Grouping, Grade Letter & Grade Point

S/N	SCORE GROUP	LETTER GRADE	GRADE POINT	REMARKS
1	95 to 100	A	4.0	a) Some universities further divide A into A+, A & A- b) The score grouping or mark range varies from universities to universities. c) Some universities have their failure range graded as F_1, F_2, etc.
2	90 to 94	B+	3.3	
3	85 to 89	B	3.0	
4	80 to 84	B-	2.7	
5	75 to 79	C+	2.3	
6	70 to 74	C	2.0	
7	60 to 69	C-	1.7	
8	50 to 59	D	1.0	
9	40 to 49	F	0.0	

NOTES:

1. The distribution of the grade points does not obey Arithmetic Progression principles or any known progression for that matter.
2. If the students' performance is not classified into four degree divisions, this expanded distribution of the grade point may not cause any error. Thus, it may be adequate for unclassified degree awards.
3. If the students' performance is to be classified into four degree divisions, this expanded distribution of the grade points is unnecessary since they will be recombined into 4 & it may cause a great error if no specific progression is followed to assign the grade points.

Table 13: Attainable Score/Mark Grouping, Grade Letter & Grade Point

S/N	SCORE GROUP	LETTER GRADE	GRADE POINT	REMARKS
1	95 to 100	A	4.00	a) Some universities further divide A into A+, A & A- b) The score grouping or mark range varies from universities to universities. c) Some universities have their failure range graded as F_1, F_2, etc.
2	90 to 94	A-	3.67	
3	85 to 89	B+	3.33	
4	80 to 84	B	3.00	
5	75 to 79	B-	2.67	
6	70 to 74	C+	2.33	
7	60 to 69	C	2.00	
8	50 to 59	C-	1.67	
9	40 to 49	D	1.00	
10	30 to 39	F	0.00	

NOTES:

1. The same notes as in Table 12 are still applicable.
2. Since this type of elongated grading system is adequate for unclassified degree awards, it is used for American degree awards; though the upper region (3.50 to 4.00) of the scale is classified arbitrarily as follows:
   - 3.90 to 4.00 as SUMMA CUM LAUDE
   - 3.75 to 3.89 as MAGNA CUM LAUDE
   - 3.50 to 3.74 as CUM LAUDE

   } This represents only 0.5*100/3 = 16.7% of the total grading scale as against 100% for British grading. Hence, this cannot be considered as degree classification.

Table 14: Components of Scores/Marks Earned

FINAL EXAMS (FE)%	CONTINUOUS ASSESSMENT (CA)%			
	Attendance	Class Tests/Quizzes	Mid-Semester Exams	Homework/Term Paper
70	0	10	10	10
60	5	10	15	10

NOTES:
Homework/Term Paper may include field trips and any other relevant academic activities as applicable.
Class Tests/Quizzes may include laboratory works and any other relevant academic activities as applicable.

[i] Postman, Neil (1992) (in England), New York City; Alfred A. Knopf. pp13
[ii] Includes but not limited to schools, colleges, universities, institute, trade centres, etc
[iii] http://www.qca.org.uk/qca_4133.aspx
[iv] Wikipedia, the free encyclopedia – Academic Grading in the United Kingdom

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